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SUBJECT: SOUTH AFRICA: U.S. OFFICIAL VISIT PAVES THE WAY FOR CLOSER BILATERAL RELATIONS IN THE FIELD OF NUCLEAR ENERGY

REF: PRETORIA 2927

Classified By: Economic Minister Counselor J. Jeff Hartley, Reasons: E.
¶O. 12958 1.5 (b) and (d)

SUMMARY

¶1. (C) Alex Burkart, Deputy Director in the Office of Nuclear Energy at the Department of State, and Ron Cherry, Director, Office of International Safeguards at the Department of Energy (DOE), visited South Africa May 17 to 21 to discuss advancing bilateral relations in the field of nuclear energy. Burkart and Cherry participated in extensive meetings with key officials at the Departments of Foreign Affairs (DFA) and Minerals and Energy (DME), and with the management teams of the National Nuclear Regulator (NNR), the Nuclear Energy Corporation of South Africa (NECSA), PBMR Ltd. (developers of the Pebble Bed Modular Reactor (PBMR)), and ESKOM's nuclear power station at Koeberg. There was firm agreement on both sides to establish a Joint Standing Committee on Nuclear Energy Cooperation (JSCNEC) and to finalize R&D agreements on nuclear energy cooperation and nuclear materials safeguard technologies. The two sides are now considering December 1-3 in Pretoria for the first JSCNEC meeting. South African officials expressed strong interest in possible collaboration in a number of areas, including new technology to use low enriched uranium (LEU) targets instead of highly enriched uranium to produce Molybdenum-99, a medical radioisotope. In general, the South Africans were more interested in collaborating on the energy than on the safeguards side, but clearly saw the need to collaborate on PBMR safeguards and on technical activities that would facilitate PBMR licensing in the United States. A constant theme throughout the week was South Africa's need for skills development and capacity building. Reftel provides an overview of visit and reports key policy developments. This cable provides details of meetings for technical officials. End Summary.

OFFICIAL DISCUSSIONS

¶2. (C) Following a courtesy call with DME Deputy Director General Nelisiwe Magubane, who expressed full support for greater bilateral cooperation, Burkart and Cherry met with the entire staff of the Office of Nuclear Affairs in DME, including Chief Director Tseliso Maqubela, Director for Nuclear Energy Haresh Haricharun, Director for Safety Schalk de Waal, and Acting Director for Non-Proliferation Elsie Monale. DFA Chief Director for Peace and Security Peter Goosen joined the second session in the afternoon. The South Africans made it clear that they were interested in pursuing closer bilateral relations at the working or technical level. Maqubela explained that the government had recently affirmed its decision to support the development of a Pebble Bed Modular Reactor (PBMR) as part of an overall strategy to provide a diverse and secure supply of inexpensive energy to the country. Both he and Goosen stressed that such a strategy included making maximum use of the country's uranium resources.

PBMR: A NATIONAL STRATEGIC PROJECT

¶3. (C) PBMR, NECSA, and ESKOM (the national electric utility) each told Burkart and Cherry that the government had recently declared PBMR a national strategic project and was in the midst of restructuring its shareholding in PBMR Ltd. The plan was that "South Africa, Inc." would hold at least a 51 percent share, with other investors taking the rest. The Department of Trade and Industry (DTI) was about to assume the lead role for the government, with the Industrial Development Corporation (a government parastatal reporting to DTI) assuming the lion's share of equity. ESKOM Enterprises has led with a 30 percent share of PBMR Ltd., but would transfer some of these holdings to the IDC, NECSA, and perhaps the rest to ESKOM Holdings, its parent company. In the end, the government would pump another USD 100 million into PBMR Ltd. and DTI Director General Allister Ruiters would become the Chairman of the Board. This structure would still allow for significant foreign investor participation,

though the only current foreign shareholder is British Nuclear Fuels (BNFL). Negotiations with AREVA continue, as do discussions with the Chinese on possible technological collaboration.

ENRICHMENT AND NONPROLIFERATION

¶4. (C) Maqubela made a point of saying that while fuel for PBMR would be imported in the short term, South Africa might want to establish an enrichment plant in the long term. Goosen made the specific point that South Africa already possessed enrichment technology and would oppose any idea in international circles that it be denied the opportunity to acquire technology needed in the future to enrich locally mined uranium ore for PBMR fuel. Goosen was quite concerned that a ban or moratorium on enrichment technology might one day preclude South Africa from developing it's own technology to support PBMR. On May 18, Burkart and Cherry met with Goosen for more than two hours to discuss this and other issues in greater detail. Goosen clearly wanted to send a message to the United States that South Africa did not believe that a ban on the transfer of enrichment technology would solve enforcement problems surrounding nonproliferation, and that South Africa was willing to work with the United States on an alternative solution.

¶5. (C) NECSA officials were a bit surprised at Goosen's position when asked about it the following day. They informed Burkart and Cherry that NECSA no longer possessed working enrichment technology and that an enrichment plant to produce low enriched uranium was quite a ways off. NECSA had no plans to get back into the uranium enrichment business since it was simply not cost effective to supply only a few nuclear power plants. In fact, NECSA was awaiting a design license from NNR to build a smelter to destroy old equipment from its pre-1990's enrichment program. Furthermore, NECSA ceased work on Molecular Laser Isotope Separation (MLIS) in 1997 when COGEMA withdrew from cooperation; this work had been shelved for the next 20 years.

¶6. (C) Director to the Nonproliferation Secretariat Daan van Beek joined the discussion with Goosen on May 18 to outline the structure and function of the Nonproliferation Council, and explain South African export and import controls on nuclear, chemical, and biological technology. After giving some examples of South African enforcement in this area, Goosen made the point that South Africa greatly appreciated U.S. intelligence when it came to the enforcement of nonproliferation laws. "We are not threatened or pressured by U.S. intelligence." he said, "Rather, we see it part of our enforcement system, as an asset." He then emphasized that South Africa viewed nonproliferation as just one side of a two edged sword -- the other being disarmament, and ventured a short lecture on whether the United States could do more on both the nonproliferation and the disarmament sides. He commented that the U.S. effort to avoid all reference to the conclusions of the 2000 Nonproliferation Treaty Review Conference (which he characterized as the "disarmament review conference") in documents from the recent Prepcom had, in effect, overwhelmed the U.S. message on Article VI.

NATIONAL NUCLEAR REGULATOR (NNR)

¶7. (C) Also on May 18, Burkart and Cherry visited the National Nuclear Regulator (NNR) in Centurion, where CEO Louisa Zondo led her management team in a presentation of NNR. Zondo explained that the NNR was a relatively new agency, having been created by the National Nuclear Regulation Act of 1999 and established in 2000. She stressed that two key areas for NNR were compliance monitoring and emergency planning. In addition, NNR was currently preoccupied with putting into place a waste management policy and strategy that would govern NECSA's Vaalputs repository. While NNR had overall responsibility to regulate all things nuclear, the control of medical sources of radiological material rested with the Department of Health.

¶8. (C) Zondo stressed that while NNR was able to access technical support from security agencies, from a management perspective it was important for NNR to develop its own in-house capacity. This would take time. NNR was exploring training programs with the U.S. Nuclear Regulatory Commission (NRC) and sister regulatory bodies. To meet current needs, NNR was looking at bringing experienced South Africans out of retirement.

¶9. (C) Zondo characterized the February emergency preparedness drill at ESKOM's Koeberg Nuclear Power Station as a success. She said that the NRC observers who attended had written a favorable report on the exercise, and extended an open invitation to NNR officials to visit the NRC in the future.

¶10. (C) Senior Manager for Nuclear Technology and Nuclear Suppliers C. Orion Philips then outlined his areas of responsibility, including the licensing process and risk control, determining compliance with best practices, the control of scrap materials, surface and underground mines, and radon measurement. This included regulatory oversight of NECSA's Safari reactor safety and safeguards, the production of Molybdenum-99 (Mo-99), and the licensing change request to use LEU to produce Mo-99. He was also responsible for waste management at NECSA's Vaalputs site.
¶11. (C) Dr. Simnanye Alex Tsela outlined his responsibilities in the regulatory strategy division, which included the review of regulatory philosophy, best practices, legislation, and international collaboration.

¶12. (C) Mr. G. Clappison outlined his responsibilities as head of the Power Reactor Division, which included Koeberg Nuclear Power Station and PBMR compliance with the conditions of their operating licenses, safety indicators, inspection programs, and outage inspections. Clappison said that NNR conducted periodic safety reviews at Koeberg, as well as physical security reviews at Koeberg, Vaalputs, and PBMR. He was in the process of reviewing safety and quality assurance aspects of PBMR designs, and assuring public participation in the licensing process. In response to Burkart's inquiry about the absence of a high-pressure containment for the PBMR, Clappison said that this would be a key licensing issue. However, NNR did not want to blindly apply light water reactor regulations to gas-cooled reactors, as the two technologies were markedly different. Clappison explained that risk evaluation must be based on assessing phenomenon that might cause the release of nuclear or other hazardous materials. Licensing would depend on assessing the risk to a person of 10xE-8 per year of reactor operation (specific risk was unspecified).

¶13. (C) Dr. D. Kgwadi explained that he was in charge of a group of 18 engineers and scientists that provided support to the rest of the organization.

NUCLEAR ENERGY CORPORATION OF SOUTH AFRICA (NECSA)
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¶14. (C) On May 19, CEO Senti Thobejani presented an overview of NECSA and how it had changed as an organization since it was known as the Atomic Energy Corporation. NECSA still operated the Safari research reactor, but had now assumed a commercial focus, with commercial sales of medical radioisotopes, chemicals, and other products and services generating 80 percent of its income -- four-fifths of which from exports. NECSA's six divisions included one that produces radioisotopes for medical applications, one that produces fluorine based chemicals, one that provides nuclear commercial services (such as pebble bed fuel manufacture), one that undertakes scientific research and provides waste management services, one that manages the 120 buildings at the Pelindaba complex, and one that provides corporate services (human resources, financial, and legal). Nuclear technology products and services included radiopharmaceuticals, irradiation services, radiochemicals, radioactive sources, and radiation services. In the medium term, NECSA hoped to increase its sales of Molybdenum-99, for which it was currently the world's fourth leading producer, by a factor of eight. Thobejane thought that the South African Government would remain NECSA's sole shareholder in the foreseeable future, but admitted that this could change someday. He explained that members of NECSA's Board of Directors were appointed by the Minister of Minerals and Energy for three-year terms, including the CEO. Thobejane took office in September 2001.

¶15. (C) Thobejani said that the government had been contemplating the creation of a new nuclear waste management agency (to be born out of NECSA), but decided against it because the size of South Africa's nuclear industry did not justify the additional investment. For this reason, NECSA would continue to fulfill this service for the government. In return, NECSA would receive approximately $20 million per year, or 20 percent of its income. This amount would also cover other services provided to government, such as the fulfillment of international nuclear safeguards agreements and limited scientific research. Thobejane explained that these days most research and development at NECSA was very much product or service driven and, therefore, closer to development engineering than to pure research. However, the Department of Science and Technology and the University of the Northwest (formerly Potchefstroom University) master's program conducted limited pure research at the Safari reactor. Thobejane added that a draft waste management strategy had been released for public comment, but the comment period had been extended through June because of the technical nature of the document.

¶16. (C) Thobejane commented that NECSA was looking at ways to rejuvenate its workforce and to develop young nuclear physicists and engineers. To this end, NECSA had formed

exchange and training partnerships with AREVA and BNFL, had created sister university partnership with Pennsylvania State University, and was considering a collaborative program with Argonne National Laboratory. NECSA's workforce currently numbered about 1500, down from 6000 in the 1990's.

NECSA's INVOLVEMENT IN PBMR

¶17. (C) Thobejane informed Burkart and Cherry that NECSA was about to intensify its involvement with PBMR Ltd. Until now, NECSA's goal had been to become the primary manufacturer of pebble bed fuel. While this goal still held, PBMR Ltd. was about to become even more important to NECSA because the South African Government had decided to transfer at least 10 percent of its shareholdings from ESKOM Enterprises to NECSA. Division Manager Fanie Venter then provided a tour of pebble bed fuel fabrication under development at a NECSA lab. The lab's short-term objective was to replicate as much as possible proven German production methods of TRISO fuel. This would serve as a measure of technology acquisition, as well as reduce the risk to PBMR Ltd. Burkart and Cherry witnessed the production of a handball sized fuel sphere made of graphite and other layered materials. At this time, no uranium loading of the spheres was taking place. NECSA needed a license for working with enriched uranium before it could proceed with plans to implant 9.6 percent enriched uranium particles into the core of the graphite fuel spheres. The current objective was to build the production capacity to manufacture 270,000 spheres per year, enough to fuel the demonstration reactor planned for Koeberg. NECSA General Manager Karel Fouche' said that PBMR already had contracts in place with the Russians for the provision of 28 kg of 10 percent LEU for the demonstration plant. In the future, however, tons of such fuel would be needed. Burkart advised NECSA officials that the USEC license application for its new enrichment plant in the United States would allow enrichment up to 10 percent, but that the new URENCO plant would be limited to 5 percent.

OTHER TOURS AT NECSA

¶19. (C) Burkart and Cherry toured the Safari reactor and also saw the IQ3 Drum Scanner in operation at the site of NECSA's decommissioned Semi-Commercial Enrichment Plant. At the reactor, Fouche' stated that NECSA was fabricating two lead test assemblies in a glove box to test reactor operation on 19.9 percent enriched uranium, vice the existing 90 percent enriched uranium reactor fuel. At the IQ3 Drum Scanning Project, funded out of Director Cherry's office at DOE, Bert Rollen of Oak Ridge National Laboratories was on hand to provide an overview of the project along with NECSA supervisors. Currently, the contents of 1074 drums out of 1104 drums with HEU contaminated waste have been scanned to determine the amount of U-235. The IAEA has verified 782 drums containing 21 kg of U-235 while 292 drums containing 5.9 kg of U-235 remain to be verified. As many as 40,000 drums containing LEU contaminated waste still needed to be scanned.

NECSA MANAGERS SUGGEST AREAS FOR COOPERATION

¶20. (C) General Manager Karel Fouche' expressed NECSA's desire to continue its involvement in the Reduced Enrichment for Research and Test Reactors (RERTR) program. Fouche' was very interested in Argentina's test using LEU targets to produce of Molybdenum 99. He welcomed the opportunity to host an August visit from Argonne National Laboratory officials, who were assisting the Argentineans. Fouche' also expressed NECSA's interest in attending the U.S. sponsored workshop for radioisotope producing countries, now scheduled for October in Vienna, Austria.

¶21. (C) NECSA Divisional Manager Pieter Bredell, whose charge was management of the Vaalputs waste site, expressed interest in sharing information with the United States on waste site management and disposal, and was open to possible U.S. assistance on the transportation of nuclear waste. In return, he thought that the United States might be interested in NECSA's pioneering bore hole concept for the disposal of spent radioactive sources 50-100 meters underground -- a technique that allowed fellow African countries with less sophisticated technology to store medical waste at sites within their own borders.

¶22. (C) Senior Manager Deitleib Tillwick thought that there was room for technical cooperation in the area of safeguards. Specifically, Manager Joseph Shayi was looking for a solution to a problem he had on meeting safeguards requirements, which impacted NECSA's PBMR fuel fabrication operations.

¶23. (C) CEO Thobejani summarized the major categories for potential bilateral collaboration as including waste management, safeguards, licensing and regulatory issues, LEU

production technology for Molybdenum 99, and skills development.

PBMR LTD.

¶24. (C) PBMR Ltd. CEO Nic Terblanche told Burkart and Cherry that the South African Government had recently decided to make PBMR a strategic national project, virtually assuring government financing for PBMR Ltd. through the development phase and allowing the construction of a demonstration reactor at Koeberg. Almost 500 engineers and scientists were now engaged in the project, including 50-60 at NECSA, 50 at South African supplier IST Nuclear, and 30 at ESKOM. If the PBMR dream came true, said Terblanche, the company would be the first to build a nuclear power plant that was inherently safe.

¶25. (C) Terblanche argued that PBMR, as a very high temperature reactor (VTHR), was ideally suited for the nuclear cogeneration component of DOE's Hydrogen Energy Initiative at the Idaho National Engineering and Environmental Laboratories (INEEL). PBMR Ltd. models already predicted temperatures near desired levels for Generation IV VHTR's. Compared to competing technologies, PBMR was safer, more cost efficient, more environmentally safe, and more flexible. Moreover, Terblanche thought that PBMR Ltd. was probably four years ahead of its nearest competitor. U.S. based Westinghouse Nuclear, a wholly owned subsidiary of shareholder BNFL, would lead PBMR Ltd.'s consortium of U.S companies that included Air Products (the world's largest producer of hydrogen) and Sargent and Lundy (an experienced engineering and construction firm in the power industry) in its INEEL bid. For those who felt that PBMR was too advanced to qualify for INEEL, Chief Technology Officer Dieter Matzner argued that there was still plenty room for further research and development oriented towards achieving even higher temperatures.

¶26. (C) If PBMR were not selected for the cogeneration project at INEEL, Terblanche said, PMBR Ltd. "would revert to Plan A," which was to roll out its product in major markets, especially the United States. In fact, success, as measured by PBMR Ltd.'s business plan, would be achieved if the company captured just 4 percent of new sales worldwide. With or without INEEL, PBMR Ltd. planned to seek an NRC license, and had already sent NRC a letter of intent. PBMR Ltd. hoped to initiate discussions with the NRC this summer, partly to engage the NRC so that PBMR would not be overlooked in the wake of the NRC's licensing process for Westinghouse' AP1000. To help with the licensing process, PBMR Ltd. was assembling an advisory group of U.S. utilities that would include former shareholder Exelon and First Energy, among other U.S. utilities and potential customers. When asked how long it would take for PBMR Ltd. to reach its targeted capital cost of around USD 1000 per installed kilowatt electric, the response was that it was important to first have sufficient orders in the pipeline to justify PBMR suppliers setting up dedicated manufacturing facilities. If this were achieved, then 70 percent of the learning would take place during the production of the first three "8-packs." By the seventh "8-pack," 98 percent of the learning would be achieved. Therefore, depending upon the starting point for cost, the targeted cost of around USD 1000 per kilowatt electric would likely be achieved between the 3rd and 7th "8-pack", or between the 24th and 56th reactor built.

¶27. (C) Senior Scientist Dr. Johan Slabber then walked Burkart and Cherry through PBMR technology. Slabber explained how safety was primarily controlled by heat production within the reactor vessel. The design also incorporated 23 control rods in addition to spheres containing boron carbide that could be activated to rapidly shut down the reactor to cold conditions. Slabber also explained why PBMR Ltd. felt that pebble fuel was better than prismatic block. First, fuel temperatures were lower. Second, there was no need for a shielded facility or down time to replace fuel blocks, since the pebbles would cycle out of the system once spent. And third, no burnable poisons were required to stretch out the fuel cycle. Slabber also explained the Brayton Cycle (the heat transfer system based on using the helium coolant to directly drive the gas turbine rather than to generate steam) and other aspects of the PBMR technology. A copy of Slabber's briefing is available from DOS/NP/NE Deputy Director Burkart.

¶28. (C) Slabber thought that PBMR development would benefit greatly from the bilateral R&D agreements now under discussion. The agreements would facilitate the exchange of information and allow INEEL scientists to test PBMR models. PBMR would be able to collaborate with the U.S. on the MELCOR code that modeled meltdown and chemical reactions, and on the Gas Reactor Severe Accident Code for air ingress events. Slabber added that PBMR Ltd. had already shared its computer codes on core neutronics with INEEL scientists so that they could conduct independent analyses.

¶29. (C) PBMR Project Manager Abrie Botma then outlined where the development and testing program stood. The University of the Northwest (previously Potchefstroom University) had built a 15-meter long, 37-ton PBMR micro model with a traditional heat source to test the Brayton Cycle. PBMR Ltd. next planned to build a helium test loop at NECSA. This loop would be three times the size of a similar one in the United States. Comment: PBMR Ltd.'s current development strategy is in sharp contrast to that pursued under former PBMR Ltd. CEO Dave Nicholls, which could best be characterized as "just build it." While not compromising any of the innovative aspects of the system, PBMR Ltd. is engaging in more extensive testing of subsystems and has stretched out the development/deployment schedule substantially. End Comment.

¶30. (C) Botma also explained that PBMR Ltd. had decided to create a number of "Centers of Excellence" around knowledge areas that were central to PBMR, including: turbine technology, Brayton Cycle technology, stochastic analysis, measurement technology, materials programs, thermo hydraulics, hydrogen generation, fuel advancements, and coolant chemistries. These centers would be managed as international resource institutions.

KOEBERG NUCLEAR POWER STATION

¶31. (C) Burkart and Cherry ended their trip with a visit to ESKOM's Koeberg Nuclear Power Station, which this year was celebrating 20 years of incident free operation. Koeberg was one of a series of French built plants with proven, standardized reactor technology based on a Westinghouse design. In fact, the French company Framatome still posted 6-8 employees at the site. Power Station Manager Peter Prozesky reviewed Koeberg's various safety and training programs, and ESKOM's decision, because of its relative isolation, to reach out to other countries like France and the United States to keep itself apprised of best practices and changing international standards. Prozesky said that because the South African Government considered Koeberg a "national key point" (a critical asset), Koeberg was under constant threat review. Prozesky also showed Burkart and Cherry the unique foundation supporting Koeberg's two reactors -- hundreds of pillars with rubber bearings to allow for sway in case of earthquake.

CAPACITY BUILDING

¶32. (C) A recurring theme throughout Burkart and Cherry's visit was South Africa's need to build technical capacity through skills development and training. Specifically, DME and DFA talked about the need to train their staff. Goosen said that DFA was developing its own nonproliferation seminar, and invited U.S. participation. NECSA talked about university exchanges and rejuvenating its workforce. NNR talked about the need for skills development and capacity building. These discussions reinforced what Magubane and Maqubela told officials in Washington during their visit last October. Clearly, capacity building and technical exchanges could be a very important part of our JSCNEC agenda.

NEXT STEPS

¶33. (C) Both sides felt that they were close to concluding R&D agreements on nuclear energy cooperation and nuclear materials safeguards technologies. The South Africans still had some issues associated with how the agreements should be framed, i.e., between governments or departments, and indicated that they might have some questions related to the annex on intellectual property. Recently, DFA told us that it planned to call the relevant parties together to discuss the R&D agreements and the possibility of holding the first JSCNEC December 1-3, 2004 in Pretoria. Both DME and NECSA have reconfirmed their desire to participate in the proposed Workshop for Medical Radioisotope Producing Countries planned for October, but need to know the new dates. NECSA has welcomed the opportunity to host an August visit from Argonne National Laboratory officials to discuss using LEU for targets to produce Molybdenum-99; Embassy/Pretoria stands ready to facilitate this visit.
HUME